CLAIMS

1. A method for planning a telecommunication network for radio apparatuses including a plurality of cells distributed over a geographical area, each of which comprises a set of elementary areas of territory (pixels) ($p_{m,n}$) adapted to receive a radio signal irradiated by a fixed radio base station (SRB), the method including for each cell the determination of a service area comprising the location of the pixels of territory ($p_{m,n}$) of the cell in which the network, on the basis of a pre-set limit value (η_{lim}) of a cell load factor (η), is able to provide predetermined services to the mobile apparatuses located therein,
characterised in that it comprises the steps of:
- identifying the pixels of territory ($p_{m,n}$) belonging to the service area pertaining to a pre-set cell according to a criterion for selection in succession based on the values of a sorting function ($R_{m,n}$) which is a function of at least the quantity of traffic ($T_{m,n}$) pertaining to the pixel of territory being examined; and
- computing the service area as a set of the pixels of territory ($p_{m,n}$) of the cell that are in succession selected so that the sum of the contributions due to each pixel of territory ($p_{m,n}$) does not exceed the pre-set limit value (η_{lim}) of the cell load factor (η).

2. A method as claimed in claim 1, characterised in that said sorting function is a function ($R_{m,n}$) of the value of electromagnetic attenuation ($a_{m,n}$) between the fixed Radio Base Station (SRB) of the pre-set cell and the pixel of territory ($p_{m,n}$) being examined, and of the quantity of

traffic ($T_{m,n}$) pertaining to the pixel of territory ($p_{m,n}$) being examined.

3. A method as claimed in claim 1 or 2, comprising a further step (340) of computing macro-diversity areas in which, for each service area previously calculated (320), a verification is made as to whether the pixels ($p_{m,n}$) outside said area, but in which the signal irradiated by the fixed Radio Base station (RBS) is received with a power exceeding a predetermined threshold can be served by radio base stations (RBS) of adjacent cells.

4. A method as claimed in any of the previous claims, comprising a further step (400) of determining the areas in unavailability or outage conditions, by considering pixels of territory ($p_{m,n}$) belonging to the service area according to a criterion for selection in succession determined by said sorting function ($R_{m,n}$).

5. A method as claimed in any of the previous claims, characterised in that the pixels of territory ($p_{m,n}$) belonging to the service areas are selected starting from the location of the pixels in which the signal irradiated by the fixed station (RBS) is received by a mobile apparatus with a power exceeding a predetermined threshold in such a way that it can be recognised and decoded.

6. A method as claimed in any of the previous claims, characterised in that the information about traffic distribution over the territory are computed starting from a plurality of predetermined values of traffic offered for each service per pixel ($T_{m,n,i}$) according to a relationship

which, for each pixel, assigns a corresponding value of equivalent traffic ($T_{m,n}$) as a function of variables that are representative of the characteristics of the radio connection.

7. A method as claimed in claim 6, characterised in that the value of equivalent traffic ($T_{m,n}$) for one pixel of territory is computed according to the relationship:

$$T_{m,n} = \frac{1}{B_0} \sum_{i=0}^{S-1} B_i \cdot T_{m,n,i}$$

where:

S is the total number of services, B_0 is the Bit rate of the service at the lowest speed, B_i is the Bit Rate of the i^{th} service present in the pixel m,n and $T_{m,n,i}$ is the traffic offered in the pixel m,n for the i^{th} service.

8. A method as claimed in claim 6 or 7, characterised in that said sorting function ($R_{m,n}$) is a function that is directly proportional to the value of electromagnetic attenuation ($a_{m,n}$) of the pixel ($p_{m,n}$) and inversely proportional to the quantity of traffic ($T_{m,n}$) of the pixel ($p_{m,n}$), according to the formula:

$$R_{m,n} = \frac{a_{m,n}}{T_{m,n}}$$

where:

$a_{m,n}$ is the attenuation between pixel m,n and radio base station and $T_{m,n}$ is the equivalent traffic of the pixel m,n and in that the selection of the pixels of territory ($p_{m,n}$) belonging to the service area takes place according to a succession determined by the increasing values of said function ($R_{m,n}$).

9. A method as claimed in claim 6 or 7, characterised in that said sorting function ($R_{m,n}$) is expressed according to the formula:

$$R_{m,n} = \sqrt{\left[\left(\frac{T_{m,n}}{T_{p,q}^{Max}}\right)^2 + \left(\frac{a_{m,n}}{a_{i,j}^{Max}}\right)^2\right]}$$

where:

$a_{m,n}$ is the attenuation between pixel m,n and radio base station and $T_{m,n}$ is the equivalent traffic of the pixel m,n the values of attenuation ($a_{m,n}$) and of equivalent traffic ($T_{m,n}$) per pixel being normalised to the maximum value of equivalent traffic and to the maximum value of attenuation of the cell.

10. A method as claimed in claim 6 or 7, characterised in that said sorting function ($R_{m,n}$) is expressed according to the formula:

$$R_{m,n} = \left|\frac{T_{m,n}}{T_{p,q}^{Max}}\right|$$

where:

$T_{m,n}$ is the equivalent traffic of the pixel m,n normalised to the maximum value of equivalent traffic of the cell.

11. A method as claimed in any of the previous claims, wherein the load factor (η) of a cell is defined as the ratio between a predetermined acceptable load of the cell and the maximum load in correspondence with which instability arises, according to the relationship

$$\eta = \sum_{i=1}^{S} n_i \cdot SAF_i \cdot (1 + f_i) \cdot SNR_i$$

where:

S is the total number of services;

n_i is the maximum number of users simultaneously active in the cell for the i^{th} service;

SAF_i is the Service Activity Factor of the i^{th} service;

f_i is the ratio between intracell interference and intercell interference; and

SNR_i is the signal/noise ratio for the i^{th} service.

12. A computing system (10) for planning a telecommunication network for radio apparatuses, programmed to implement a method as claimed in any of the claims 1 through 11.

13. Radio network planned using the method as described in claims 1 through 11.

14. Computer program product or group of computer program products executable by at least one computing system (10), comprising one or more modules of code for the implementation of a method for planning a telecommunication network for radio apparatuses as claimed in any of the claims 1 through 11.